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(54) **COMPOSITE WHEEL**

VERBUNDRAD

ROUE COMPOSITE

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Description**Field of the Invention**

5 [0001] The present invention relates to a wheel combining an aluminum alloy with a non-metallic material.

Background of the Invention

10 [0002] At present, aluminum alloy wheels are widely used with the development of the automotive industry. The aluminum alloy wheels have good load-bearing property and heat dissipation property, and are lighter than steel wheels, thus meeting the lightweight requirement of wheels.

15 [0003] However, engineers hope to design more artistic wheels for automobiles with the increasing aesthetic requirements. For example, sometimes the engineer hopes to design a wheel with multiple (e.g., 8-12) spokes, or a wheel with wider spokes. In this case, the ratio of the spokes to the window area is high. In terms of mechanical properties, the spokes cannot be made too thin. Thus, the weight of the aluminum wheel is often much higher than the weight necessary to meet its mechanical strength, the lightweight effect of the wheel made of aluminum alloy is reduced to some extent, and the social requirements for low energy consumption and low emission cannot be met.

[0004] As people's requirements for energy conservation, environmental protection, novelty and the like of automotive products increase, it is necessary to redesign the structure of the existing aluminum wheels to obtain lighter wheels.

20 [0005] CN 205 059 051 U provides a composite material automobile wheel hub, wherein the skeleton of wheel hub is wrapped by a chopped fiber reinforced composite layer, which skeleton includes a spoke skeleton made of continuous fibers reinforcing composite material.

Summary of the Invention

25 [0006] Accordingly, the object of the present invention is to provide a lighter wheel to meet the requirement for lightweight of wheels. Meanwhile, the wheel should be able to meet the engineer's requirement for appearance design of the wheel, enabling a larger spoke/window area ratio.

30 [0007] To this end, the present invention provides a composite wheel according to claim 1. Some features of optional or preferred embodiments are recited in the dependent claims.

[0008] In one aspect of the present invention, provided is a composite wheel, including spokes, a rim and a central disc, one end of each spoke being connected to the central disc and the other end being connected to the rim, wherein each spoke includes a spoke skeleton and a spoke shell, and the spoke skeleton is wrapped by the spoke shell; and the spoke shell is made of plastic, rubber, nylon or resin.

35 [0009] Further, the spoke skeleton has a T-shaped or π -shaped cross section, the top transverse edge of T-shaped or π -shaped spoke skeleton is disposed close to the outer surface of a hub, and the longitudinal edge is disposed to point to the inner cavity of the hub.

40 [0010] In a preferred aspect of the present invention, the top transverse edge of T-shaped or π -shaped spoke skeleton has a thickness of 6-8 mm and the longitudinal edge has a thickness of 3-5 mm. In a preferred aspect of the present invention, the spoke skeleton is in one spoke, the top transverse edge has a width of 22-45 mm and the longitudinal edge has a width of 25-40 mm. In a preferred aspect of the present invention, the spoke skeletons are integrated with the central disc and the rim.

[0011] According to the invention, the spoke skeletons, the central disc and the rim are made of A356.2 aluminum alloy.

45 [0012] The technical solution of the present invention brings the beneficial technical effects of overcoming the contradiction between the pursuit of the artistic design effect of the wheel and the pursuit of the lightweight of the wheel and meeting the strength requirement of the wheel.

Brief Description of the Drawings

50 [0013] The embodiments of the present invention will be described in detail below in combination with the accompanying drawings, in which:

Fig. 1 is a structure diagram of a wheel according to embodiment 1 of the present invention.

55 Fig. 2 is a schematic diagram of a cross section of a wheel spoke according to embodiment 1 of the present invention.

Fig. 3 is a schematic diagram of a cross section of another wheel spoke according to the present invention.

[0014] In which: 1-spoke skeleton, 2-spoke shell, 3-brake disc, 21-longitudinal edge of T-shaped spoke skeleton, 22-top transverse edge of T-shaped spoke skeleton, 23-spoke shell of T-shaped hub skeleton, 31-longitudinal edge of π -shaped spoke skeleton, 32-top transverse edge of π -shaped spoke skeleton, 33-spoke shell of π -shaped hub skeleton.

5 Detailed Description of the Embodiments

Embodiment 1

[0015] This embodiment provides a composite wheel, including spokes, a rim and a central disc, one end of each spoke being connected to the central disc and the other end being connected to the rim, wherein each spoke includes a spoke skeleton and a spoke shell, and the spoke skeleton is wrapped by the spoke shell; and the spoke shell is made of plastic. The spoke skeleton has a T-shaped cross section, the top transverse edge of T-shaped spoke skeleton is disposed close to the outer surface of a hub, the longitudinal edge is disposed to point to the inner cavity of the hub, and the cross section of the spoke is as shown in Fig. 2. The top transverse edge T-shaped spoke skeleton has a thickness of 6 mm, the longitudinal edge has a thickness of 5 mm, the top transverse edge has a width of 22 mm, and the longitudinal edge has a width of 40 mm. The spoke skeletons, the central disc and the rim are made of A356.2 aluminum alloy and integrated.

Embodiment 2

[0016] This embodiment provides a composite wheel, including spokes, a rim and a central disc, one end of each spoke being connected to the central disc and the other end being connected to the rim, wherein each spoke includes a spoke skeleton and a spoke shell, and the spoke skeleton is wrapped by the spoke shell; and the spoke shell is made of plastic. The spoke skeleton has a T-shaped cross section, the top transverse edge of T-shaped spoke skeleton is disposed close to the outer surface of a hub, the longitudinal edge is disposed to point to the inner cavity of the hub, and the cross section of the spoke is as shown in Fig. 2. The top transverse edge of T-shaped spoke skeleton has a thickness of 8 mm, the longitudinal edge has a thickness of 3 mm, the top transverse edge has a width of 45 mm, and the longitudinal edge has a width of 25 mm. The spoke skeletons, the central disc and the rim are made of A356.2 aluminum alloy and integrated.

Embodiment 3

[0017] This embodiment provides a composite wheel, including spokes, a rim and a central disc, one end of each spoke being connected to the central disc and the other end being connected to the rim, wherein each spoke includes a spoke skeleton and a spoke shell, and the spoke skeleton is wrapped by the spoke shell; and the spoke shell is made of plastic. The spoke skeleton has a T-shaped cross section, the top transverse edge of T-shaped spoke skeleton is disposed close to the outer surface of a hub, the longitudinal edge is disposed to point to the inner cavity of the hub, and the cross section of the spoke is as shown in Fig. 2. The top transverse edge of T-shaped spoke skeleton has a thickness of 7 mm, the longitudinal edge has a thickness of 4 mm, the top transverse edge has a width of 30 mm, and the longitudinal edge has a width of 30 mm. The spoke skeletons, the central disc and the rim are made of A356.2 aluminum alloy and integrated.

Comparative Example 1

[0018] The shape of the wheel of Embodiment 1 was modeled, and an all-aluminum alloy hub was cast in accordance with this shape.

Comparative Example 2

[0019] The shape of the wheel of Embodiment 1 was modeled, but each spoke was composed of an aluminum alloy layer and a non-metallic material layer. The thickness of the aluminum alloy layer was designed such that its overall weight was 15.50 kg and the overall shape was the same as that in Embodiment 1. At this time, the aluminum alloy portion in the spoke had a thickness of 9.4 mm and was located on the side of the wheel spoke facing the inner cavity. The side of the wheel spoke facing the outside was made of plastic.

Embodiment 4

[0020] 60 wheels of Embodiments 1-3 and Comparative Example 1 were weighed respectively, and the average

weights thereof were shown in Table 1:

Table 1: Weights of wheels of Embodiments 1-3 and Comparative Example 1

Group No.	Average weight /kg	Weight reduction ratio /%
Embodiment 1	15.01	16.15
Embodiment 2	14.75	17.60
Embodiment 3	15.23	14.92
Comparative Example 1	17.90	----
Comparative Example 2	15.50	13.41

[0021] It can be seen from the table that the wheels of Embodiments 1-3 achieve a weight reduction effect of 14.92-17.60%. Meanwhile, the prepared wheels of Comparative Example 2 reduce the weight by 13.41%.

Embodiment 5

[0022] This test was carried out on a wheel 90-degree impact tester built by Dicastal. The main impact hammer was 910 kg, the auxiliary balancer was 100 kg, and three springs with the rigidity of 1.07 kN/mm were disposed between the main hammer and the auxiliary balancer. An initial deformation of 6 mm was added to the coil springs during assembly. The tire was mounted on the surface of the hub, and the hub was mounted on the 0-degree impact tester having an impact height of 127 mm. After the test, if the wheel had no cracks (inspected with a dye penetrant inspection agent), no obvious degeneration and no sharp air leakage, then the test is pass.

[0023] 12 groups of wheels in Embodiments 1-3 of the present invention and Comparative Examples 1-2 were tested in parallel. The wheels of Embodiments 1-3 and Comparative Example 1 all passed the test. Only 3 groups of wheels of Comparative Example 2 had no obvious cracks after the impact test (but had obvious cracks after inspection with a dye penetrant inspection agent).

Claims

1. A composite wheel, comprising spokes, a rim and a central disc, one end of each spoke being connected to the central disc and the other end being connected to the rim, wherein each spoke comprises a spoke skeleton (1) and a spoke shell (2; 23, 33), **characterized in that** the spoke skeletons (1), the central disc and the rim are made of A356.2 aluminum alloy, wherein each spoke skeleton (1) has a T-shaped or π -shaped cross section and is wrapped by the spoke shell (23, 33), and the spoke shell is made of plastic, rubber, nylon or resin, with the T-shaped or π -shaped spoke skeleton being fully embedded in the spoke shell, wherein the top transverse edge (22, 32) of T-shaped or π -shaped spoke skeleton is disposed close to the outer surface of a hub, and the longitudinal edge (21, 31) is disposed to point to the inner cavity of the hub.
2. The wheel according to claim 1, **characterized in that** the top transverse edge (22, 32) of T-shaped or π -shaped spoke skeleton has a thickness of 6-8 mm and the longitudinal edge (21, 31) has a thickness of 3-5 mm.
3. The wheel according to claim 1, **characterized in that** for the T-shaped or π -shaped spoke skeleton (1) in one spoke, the top transverse edge (22, 32) thereof has a width of 22-45 mm and the longitudinal edge (21, 31) has a width of 25-40 mm.
4. The wheel according to claim 1, **characterized in that** the spoke skeletons (1) are integrated with the central disc and the rim.

Patentansprüche

1. Verbundrad umfassend Speichen, einer Felge und einer zentralen Scheibe, wobei ein Ende jeder Speiche mit der zentralen Scheibe und das andere Ende mit der Felge verbunden ist, wobei jede Speiche ein Speichenskelett (1) und eine Speichenschale (2; 23, 33) umfasst, **dadurch gekennzeichnet, dass** die Speichenskelette (1), die zentrale

Scheibe und die Felge aus A356.2-Aluminiumlegierung bestehen, wobei jedes Speichenskelett (1) einen T- oder π -förmige Querschnitt hat und von der Speichenschale (23, 33) umschlungen wird, und wobei die Speichenschale aus Kunststoff, Gummi, Nylon oder Harz besteht, wobei das T- oder π -förmige Speichenskelett vollständig in der Speichenschale eingebettet ist, wobei die obere Querkante (22, 32) des T- oder π -förmigen Speichenskeletts nahe der Außenfläche einer Nabe angeordnet ist, und wobei die Längskante (21, 31) so angeordnet ist, dass sie zum inneren Hohlraum der Nabe weisend angeordnet ist.

2. Verbundrad nach Anspruch 1, **dadurch gekennzeichnet, dass** die obere Querkante (22, 32) des T- oder π -förmigen Speichenskeletts eine Dicke von 6-8 mm und die Längskante (21, 31) eine Dicke von 3-5mm aufweist.
3. Verbundrad nach Anspruch 1, **dadurch gekennzeichnet, dass** für das T- oder π -förmige Speichenskelett (1) in einer Speiche, die obere Querkante (22, 32) des Speichenskeletts eine Breite von 22-45 mm aufweist und die Längskante (21, 31) eine Breite von 25-40 mm aufweist.
4. Verbundrad nach Anspruch 1, **dadurch gekennzeichnet, dass** die Speichenskelette (1) mit der zentralen Scheibe und der Felge integriert sind.

Revendications

1. Une roue composite, comprenant des rayons, une jante et un disque central, une extrémité de chaque rayon étant reliée au disque central et l'autre extrémité étant reliée à la jante, dans laquelle chaque rayon comprend un squelette de rayon (1) et une coquille de rayon (2; 23, 33), **caractérisé en ce que** les squelettes de rayon (1), le disque central et la jante sont en alliage d'aluminium A356.2, dans lequel chaque squelette de rayon (1) a une section transversale en forme de T ou de π et est enveloppé par la coque de rayon (23, 33), et la coque de rayon est en plastique, de caoutchouc, de nylon ou de résine, avec le squelette de rayon en forme de T ou de π étant entièrement intégré dans la coque de rayon, dans lequel le bord transversal de haut (22, 32) du squelette de rayon en forme de T ou de π est disposé à proximité de la surface externe d'un moyeu, et le bord longitudinal (21, 31) est disposé pour pointer vers la cavité interne du moyeu .
2. La roue selon la revendication 1, **caractérisé en ce que** le bord transversal de haut (22, 32) du squelette de rayon en forme de T ou de π a une épaisseur de 6 à 8 mm et le bord longitudinal (21, 31) a une épaisseur de 3 à 5 mm.
3. La roue selon la revendication 1, **caractérisé en ce que** pour le squelette de rayon en forme de T ou de π (1) dans un rayon, le bord transversal de haut (22, 32) de celui-ci a une largeur de 22 à 45 mm et le bord longitudinal (21, 31) a une largeur de 25-40 mm
4. La roue selon la revendication 1, **caractérisée en ce que** les squelettes de rayons (1) sont intégrés au disque central et de la jante.

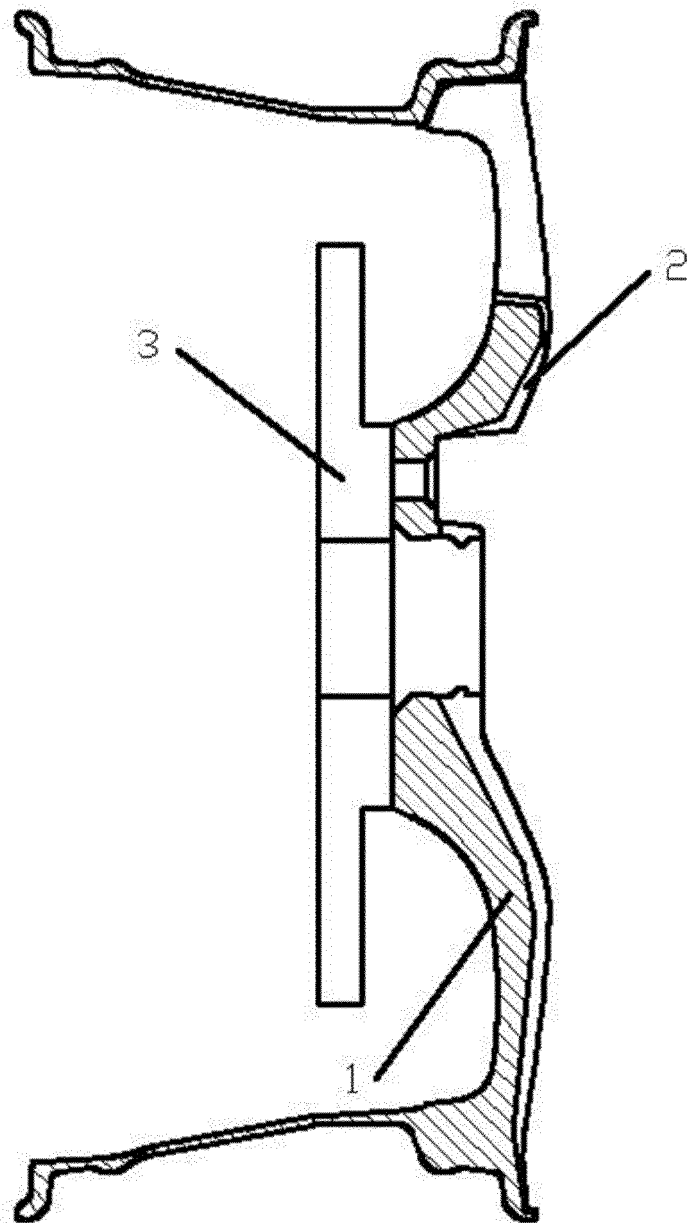


Fig. 1

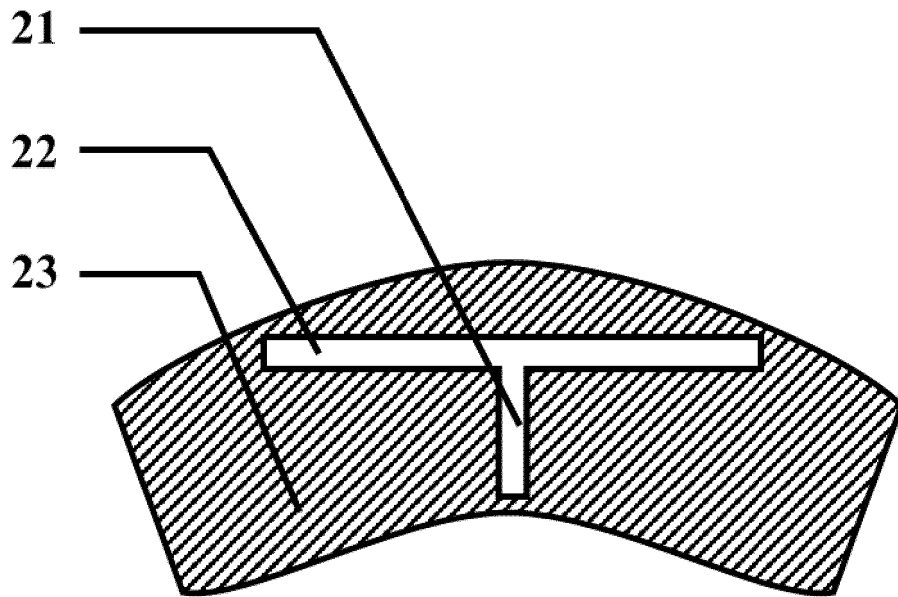


Fig. 2

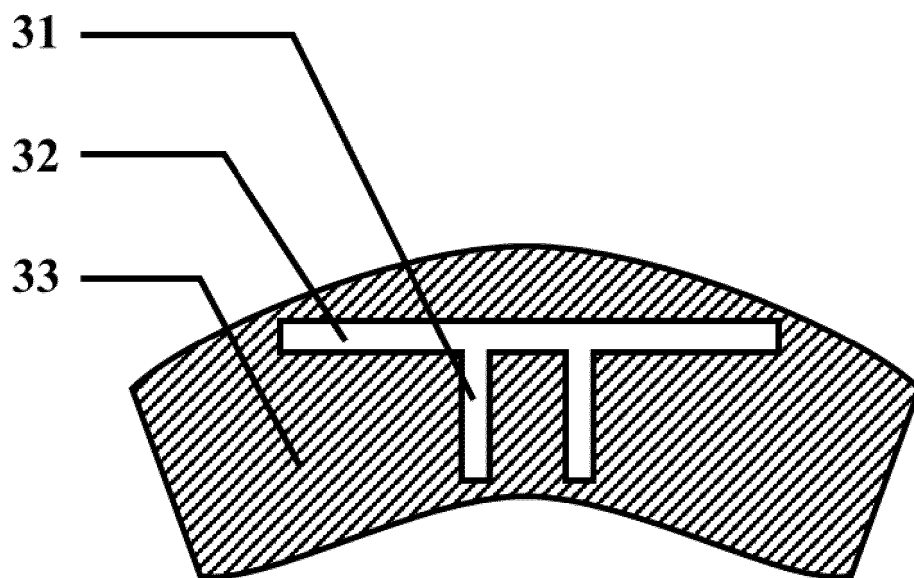


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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